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# IMAGE PICKUP DEVICE
[Satsuzo sochi]

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[Claims] /*

[Claim 1] An image pickup device characterized by having an image formation means, an image pickup means that converts signals formed by means of said image formation means into video signals, a display means used to monitor said video signals, and a flash means used to perform flash photography of a photographic subject, said image pickup device is also characterized by having a means to switch the display state of said display means so as to conserve power while said flash means is preparing to perform flash photography.

[Claim 2] An image pickup device as set forth in Claim 1 characterized by said display means being a liquid crystal display monitor.

[Claim 3] An image pickup device characterized by having an image formation means, an image pickup means that converts signals formed by means of said image formation means into video signals, a photometry means used to measure the brightness of a photographic subject, and a display means used to monitor said video signals, said image pickup device is also characterized by having a means to change the display state of said display means in response to the brightness of a photographic subject measured by said photometry means.

[Claim 4] An image pickup device as set forth in Claim 3 characterized by said display means being a liquid crystal display monitor.

* Claim and paragraph numbers correspond to those in the foreign text.

[Detailed Description of the Invention]

[0001] [Industrial Application]

The present invention relates to an image pickup device such as an electronic camera with a monitor or a video camera with a monitor that can view photographed images and reproduced images using a liquid crystal display monitor.

[0002] [Prior Art]

Conventionally, devices related to monitors used to display images such as an electronic camera and strobes used for flash photography have been proposed. However, a significant amount of power was required to use these two devices at the same time resulting in the power supply, such as a battery, being rapidly consumed and the problem of a power supply for simultaneous operation of these two devices and the measures taken were described. In particular, the LCD drive power and the power used by the back light in a device that uses a liquid crystal display monitor comprising a large LCD will become very large compared to an electronic viewfinder.

[0003] In addition, a monitor the photographer can see at a dark location is assumed when taking a photograph of a dark photographic subject that requires a strobe. For this case, the photographed image can be seen even if the back light of the monitor is comparatively dark. In contrast, the viewing state of the photographer is assumed to be at a bright location when taking a photograph of a bright

photographic subject. For this case, if the back light of a liquid crystal display monitor did not become brighter in response to the surrounding brightness, the image projected in the liquid crystal display monitor was difficult to see and the photographer had to block the external light to make it easier to see by manually adjusting the back light or attaching a hood on the periphery of the monitor.

[0004] [Problems to be Solved by the Invention]

As described above, when the same battery used for a liquid crystal display monitor is used as a power supply in a conventional electronic camera, the current that is drawn from the battery one time will be restricted. Because of this, it became difficult to ensure enough current to charge the strobe without changing the power supply used by the liquid crystal display monitor as well as the power used, thereby resulting in a defect of the strobe charging time becoming longer if it was charged using a small amount of current.

[0005] Even further, the photographer had to manually adjust the back light of the liquid crystal display monitor to an easy-to-see brightness and it was challenging for the photographer to change the brightness according to an easy-to-see brightness in response to the surrounding brightness.

[0006] The objective of the present invention is to provide an electronic camera that can ensure a power supply sufficient to charge the strobe when using a liquid crystal display monitor as well as can

adjust the brightness of the back light of a display device in response to the surrounding brightness in order to solve these problems.

[0007] [Means for Solving the Problems]

In order to realize the above-mentioned objectives, the camera of the present invention in Claim 1 is an image pickup device that has an image formation means, an image pickup means that converts signals formed by means of the image formation means into video signals, a display means used to monitor the video signals, and a flash means used to perform flash photography of a photographic subject, and this image pickup device also has a means to switch the display state of the display means so as to conserve power while the flash means is preparing to perform flash photography. In Claim 2 the display means is a liquid crystal display monitor. In Claim 3 the camera of the present invention in Claim 1 is an image pickup device that has an image formation means, an image pickup means that converts signals formed by means of the image formation means into video signals, a photometry means used to measure the brightness of a photographic subject, and a display means used to monitor the video signals, and this image pickup device also has a means to change the display state of the display means in response to the brightness of a photographic subject measured by the photometry means. In Claim 4 the display means is a liquid crystal display monitor.

[0008] [Function]

According to Claim 1 of the present invention, a current necessary and sufficient to charge the strobe is ensured by means of darkening the brightness of the liquid crystal display monitor while charging the strobe. In addition, according to Claim 3, the brightness surrounding the photographer is also judged to be dark when the image being photographed is dark during a photometric measurement and the back light of the monitor is darkened. Even further, according to Claims 2 and 4, a display means is obtained that conserves power and has a simple composition.

[0009] [Embodiment]

Fig. 1 and Fig. 2 are perspective views of the electronic camera device of an embodiment of the present invention. In Fig. 1, 1A is a main electronic camera unit, 1B is a main image display device unit, 1C is a recording medium, and 1D is a power supply.

[0010] Furthermore, 1 is a main outer sheath, 2 is a power supply switch, 3 is a release switch, and 4 is an optical finder. The release switch 3 is a double throw switch. This switch is comprised such that the first throw opens the switch 1 and a photography preparation operation, such as ranging or photometric measurement, is performed and if the switch 2 is turned ON by the second throw, a photography operation is performed.

[0011] 5a and 5b are LEDs which light while charging a strobe (5a) of a strobe and when there is a focus warning (5b). 6 is a

liquid crystal display unit of the main unit and as shown in Fig. 4, is comprised by a two-line seven-segment display 6a, a remaining battery power indicator 6b, a strobe light switching display 6c, and a self-timer photography indicator 6d.

[0012] 7a to 7e are various types of manual operation buttons. 7a and 7b are selection switches used for selecting a recorded image to be reproduced or deleted, 7c is a mode switch of the main electronic camera unit 1A used to switch between record / reproduce / delete, 7d is a strobe switch used to turn the strobe illumination ON / OFF, and 7e is a self switch used to switch between normal photography and self-timer photography.

[0013] 8a is an interface (I / F) connector that connects the main electronic camera unit 1A to the main image display device unit 1B and is provided at a position corresponding to an I / F connector 8b (not shown in the figure) on the side of the main image display device unit 1B. 9 is a battery cover. In Fig. 2, 10 is a photographic lens and 11 is a strobe light.

[0014] Next, the main image display device unit 1B that can be attached to and removed from a main image pickup device 1A will be described. This main image display device unit 1B functions as a monitor of the images photographed by the main image pickup device 1A.

[0015] 101 is a cover and 102 is an LCD display device that functions as an electronic viewfinder that displays the image being

photographed, a monitor that displays the reproduction of a recorded image, and a display device that displays the operation key of the image pickup device.

[0016] 104 is a power supply switch. 105a is a locking hook that secures the image display device 1B to the main electronic camera unit. This hook is fixed at an approximate position where the cover 1 of the main electronic camera unit 1A and the cover 101 of the image display device 1B are attached. 106 is a release lever used to remove the main image display device unit 1B from the main electronic camera unit 1A and operates together with locking hooks 105a and 105b.

[0017] The recording medium 1C is comprised by a memory card or a hard disk and is installed from an insertion opening of the main electronic camera unit 1A. Images and supplemental information are recorded through the interface (I/F) of a card such as an internal PCMCIA. The power supply 1D is a dry cell battery or a DC power supply and supplies power to the main image display device unit 1B from I/F connectors between 1A to 1B.

[0018] Fig. 3 is an outline block diagram showing the composition of an electronic camera.

[0019] The main electronic camera unit 1A is internally equipped with an image formation means 31 that forms images photographed from external light, an image pickup device 32 that converts images into video signals, a signal processing means 33 that performs processing such as converting and compressing various types of video signals and

generating a focus voltage, a strobe 34 used when performing flash photography, a CPU 35 that controls the entire main electronic camera unit, a recording means 36 that is equivalent to a recording medium IC that records images, and a power supply device 37 that is equivalent to the power supply 1D. The power supply device 37 supplies power to each of the devices 31 to 36 inside the main electronic camera unit.

[0020] The main image display device unit 1B is internally equipped with an LCD 38 that displays images, and a back light 39 and a back light regulation means 30 which are the illumination devices for this LCD. Power is supplied to the B1 side from the power supply device 37. The power that is supplied to the back light 39 is regulated from the back light regulation means 30 so as to form a brightness L based on a brightness L of the back light 39 determined by the CPU 35.

[0021] After the image pickup device 32 converts images which were formed by image formation means 31 and the images undergo gamma conversion, A / D conversion, and compression through the signal processing means 33, they are input and recorded on a memory card (recording device 36).

[0022] Video signals identical to recorded images are input and displayed on LCD 38 in the image display device 1B. In order to make the liquid crystal display easy-to-see, the power is adjusted by the

back light adjustment device 30 to reach a desired brightness and the LCD 38 is illuminated.

[0023] Next, the operation of the electronic camera of this embodiment in Fig. 1 to Fig. 4 will be described following the flowchart of Fig. 5. In the following processes each step is abbreviated to S.

[0024] In S1, the device is initialized started by turning ON the power.

[0025] Next, in S2, if the first release switch is set to a standby state and a switch is turned ON, a through image that is being photographed by the image pickup device will be displayed in the LCD 38 (S3).

[0026] Next, the average brightness of the entire screen is found by averaging the values which were converted into brightness signals by the signal processing means 33 from the video signals of the images projected in the image pickup device 32. Then, photometric measurements are performed by calculating the brightness of a photographic subject from that average brightness, the diaphragm value while taking a photograph, and the value of the shutter speed (S4).

[0027] In S5, the CPU 35 determines the brightness L of the back light 39 of the LCD 38 proportional to the photographic subject brightness based on the photometrically measured brightness of the photographic subject and sends that value L to the back light

regulation means 30. The back light regulation means 30 then lights the back light 39 using power based on the brightness L. Since the back light 39 brightly lights up at a bright photography location or darkly lights up at a dark photography location, wasteful power consumption can be prevented.

[0028] Next, in S6, a focus lens (not shown in the figure) within the image formation means 31 is driven and then the focus lens moves such that the focus voltage generated by the signal processing means generated from video signals becomes the maximum voltage. Since the lens will not be focused while the focus lens is moving, the fact that the lens is not focused and a photograph cannot be taken is indicated by the blinking of the LED 5b of Fig. 1, thereby notifying the photographer of this state.

[0029] When the strobe light is selected by the strobe switch 7d, the camera will take flash photographs and will be judged to emit a strobe light (S7). The process will move to S11 when a strobe light is not emitted.

[0030] When a strobe light is emitted, a large amount of current must be ensured in order to charge the strobe capacitor. For this reason, in S8, the CPU 35 sends a signal to back light adjustment device 30 such that the brightness of the back light becomes a predetermined specified quantity $L_0$ and by means of restricting the brightness of the back light to $L_0$ while charging the strobe, it is possible to ensure enough current flowing in the strobe capacitor to

charge the strobe without exceeding the allowable amount of current flowing in the power supply device 37. The value of L is simultaneously stored in the memory of the CPU. Thereafter, in S9, the strobe will begin to charge. The LED 5a will flash during the charge.

[0031] When the charge completes, the brightness of the back light will return to L (S10). The flashing LED 5a will simultaneously change to being continuously lit in order to notify the photographer that the charge is complete. This allows the photographer to know that the charge is complete and the process will enter a second release standby state (S11). If the second release is pressed by the photographer, the strobe will emit light when the strobe is selected and a photograph will be taken (S12).

[0032] Even when using Claim 3 of the present invention for a video camera, it is obvious that the same effect can be obtained by feeding the brightness of the video signals from the image pickup means and the diaphragm and shutter speed at that time back to the brightness of the back light of the LCD and then lighting the back light using the brightness that is proportional to the photographic subject.

[0033] [Effect of the Invention]

As described above, according to the image pickup device of Claim 1 of the present invention, enough power can be ensured to charge the strobe by darkening the LCD of an image display device

while the strobe is charging to conserve power, allowing the strobe to be quickly charged and photographs taken. In addition, it is also possible to extend the consumption time of a battery by conserving wasteful power while charging the strobe. Furthermore, since the photographer can view the monitor at a comparatively dark location in a photography state that requires a strobe light, the monitor can be viewed without any problems even if the back light becomes somewhat dark.

[0034] According to Claim 3, since the brightness of the back light of the liquid crystal display monitor is changed depending on the brightness of the photographic subject during a photometric measurement, the monitor can always be viewed in an easy-to-see state and the conservation of power can be measured without wastefully consuming power. In addition, since the photographer does not need to adjust the brightness of the back light in response to the surrounding brightness, bothersome operations are reduced.

[Brief Description of the Drawings]

Fig. 1 is a perspective view of the electronic camera device of an embodiment of the present invention;

Fig. 2 is a perspective view of the electronic camera device of an embodiment of the present invention;

Fig. 3 is a block diagram of the electronic camera of an embodiment of the present invention;

Fig. 4 shows the liquid crystal display unit of the electronic camera of an embodiment of the present invention;

Fig. 5 is a flowchart showing the operation of the electronic camera of an embodiment of the present invention.

[Description of Symbols]

30 Back light regulation means

31 Image formation means

32 Image pickup device

33 Signal processing means

34 Strobe

35 CPU

36 Recording device

37 Power supply device

38 LCD

39 Back light

1A Main electronic camera unit

1B Main image display device unit

1C Recording medium

1D Power supply

L Brightness of LCD

Fig. 4

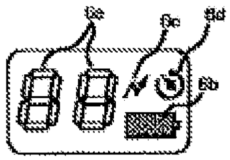
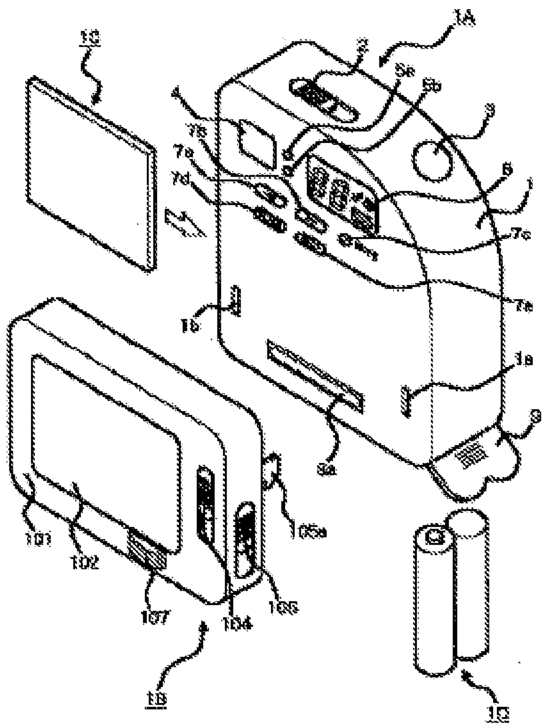


Fig. 2 Fig. 2 /5



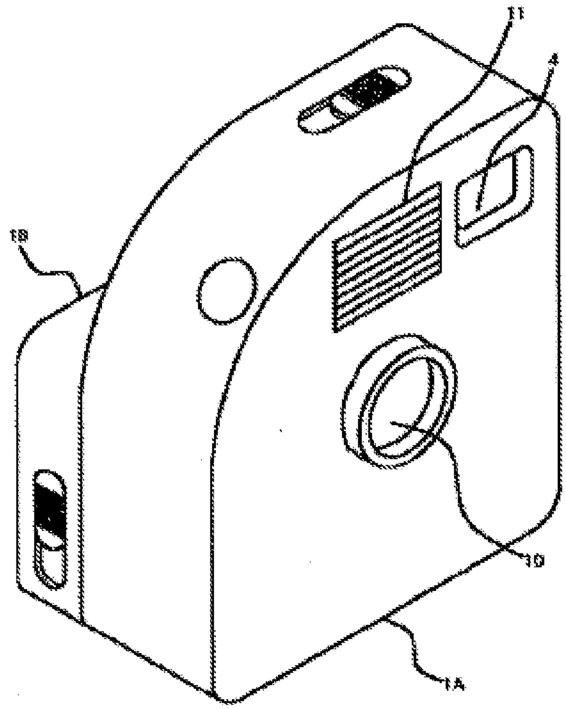
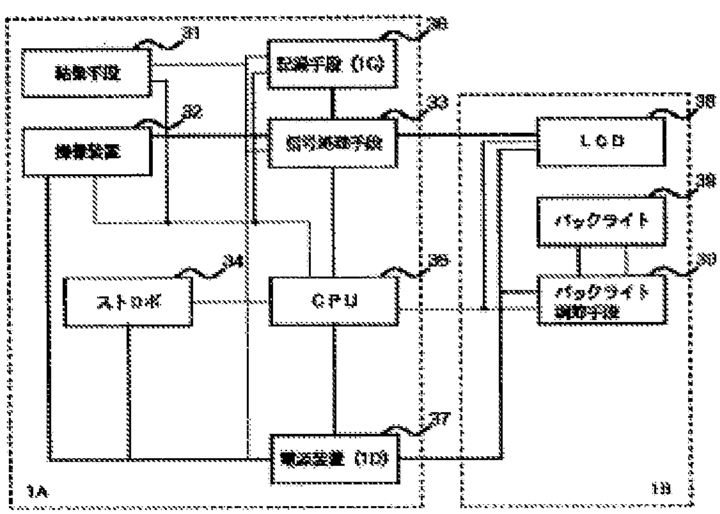


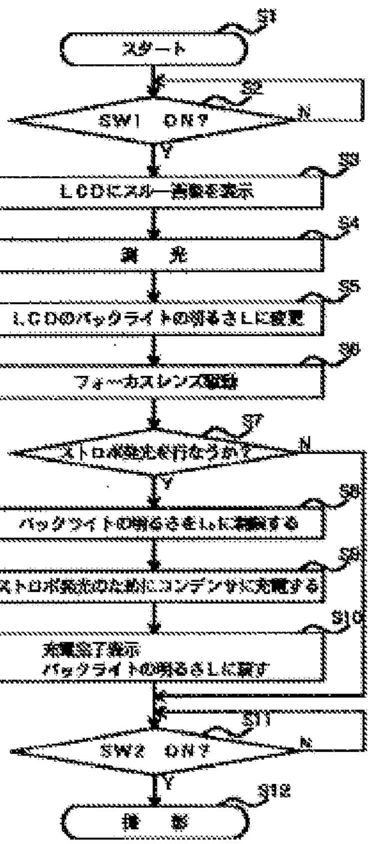
Fig. 3




31 Image formation means
32 Image pickup device
34 Strobe
36 Recording device
33 Signal processing means
35 CPU
37 Power supply device (1D)
38 LCD
39 Back light
30 Back light regulation means

Fig. 5

/6




S1 Start
S3 Display through image in LCD
S4 Photometric measurement
S5 Change to brightness L of back light of LCD
S6 Drive focus lens
S7 Is strobe emitting light?
S8 Restrict brightness of back light to $L_0$
S9 Charge to capacitor in order to emit strobe light
S10 Charge display complete. Return to brightness of back light
S12 Take photograph